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Note on a Gigantic Squid obtained from the Stomach of a Sperm Whale.

BY

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With Plates XLIII & XLIV.

The description of a gigantic squid here given is made from a specimen in the Fishery station at a small village called Samé belonging to the Prefecture of Aomori, and brought from the station by C. ISHIKAWA, who on his visit there in 1912 found the specimen in a tin box filled with very weak formalin. To the director of the station, Mr. KOIWA, as well as to the Ex-Governor of Aomori Prefecture, Dr. C. TAKEDA, the authors tender their best thanks for their kindness in lending the valuable specimen.

The squid is said to have been found in the stomach of a sperm whale caught in the open sea off the south of the strait of Tugaru during the month of August, 1911. As might be expected, the specimen is not a complete one, having been partly digested. The body was torn into three pieces, consisting of head, mantle, and fin; in all these parts the epidermis is wanting and no traces of the pen, the masticating organs, the eyes, or of the internal organs were to be seen. In the following pages a description is given of the parts as far as it was possible, and by comparing this with the descriptions of similar specimens hitherto given by different authors,* the systematic position of the specimen is established.

Mantle:—The mantle is torn into two pieces, an anterior larger and a posterior smaller portion. The larger portion measures 920 mm in

* Such as Dall, Verrill, and Thompson.

length; its anterior half is nearly complete, but in the posterior half only the ventral and the left portions remain, while the rest is lost altogether. The foldings of the dermis of the mantle are directed more or less obliquely and transversally, and there is a distinct furrow along the mid-dorsal line of the mantle, which, however, appears to have no direct connection with the development of the per. The mantle cartilages are simple, represented by longitudinal ridges of about 175 mm, fading out gradually and posteriorly.

The exact length of the mantle can not be made out, but by connecting two pieces by the cut edges which fit tolerably well to each other, we estimated it to be about 1220 mm.

The measurements of the circumference of the mantle at different levels of the anterior larger piece are as follows:—

At the anterior edge of the mantle.....	500 mm.
At a point 60 mm from the mantle edge.....	460 mm.
“ “ “ 100 mm “ “ “ “	440 mm.
“ “ “ 200 mm “ “ “ “	490 mm.
“ “ “ 300 mm “ “ “ “	510 mm.
“ “ “ 400 mm “ “ “ “	520 mm.
“ “ “ 500 mm “ “ “ “	504 mm.
“ “ “ 600 mm “ “ “ “	504 mm.
“ “ “ 700 mm “ “ “ “	440 mm.
“ “ “ 800 mm “ “ “ “	360 mm.
“ “ “ 900 mm “ “ “ “	160 mm.

The posterior smaller piece of the mantle measures 290 mm in length, with a diameter of 35 mm at its anterior end.

From these measurements it will be seen that the general shape of the mantle is evenly conical with the anterior edge somewhat expanded: bulging out a little posteriorly, the greatest breadth being at about $\frac{1}{3}$ of the length of the mantle from the anterior edge, gradually becoming narrower till about $\frac{3}{4}$, whence it suddenly narrows to the posterior end.

Fins:—The fins taken together are trapezoidal, the posterior third markedly narrowed and sharply produced. The greatest length of the fin measures 610 mm, the lines attached to the mantle being 610 mm. The

greatest breadth across the lateral angles measures 460 mm. The fins appear not to be quite symmetrical on both sides, the greatest breadth of the left fin lying a little in front of the right.

Head.:—The dorsal skin of the head presents a dark violet color. The eye-balls, the buccal apparatus, and cranial cartilages being worn off, we can not give any descriptions of these important parts, except the following points. These are the anterior circular margin of the neck, which in the middle line is produced backward in form of a blunt triangle; the extent of the sinus of the right eye-lid, which ends directly at the base of the third arm; the presence of three longitudinal foldings along the neck, and the absence of the foldings of the nape.

Siphon.:—The siphon is conical in shape. It has a large internal valve near its entrance which is overlapped by the dorsal edge of the siphon. The length of the siphon in the mid-ventral line measures 92 mm, the side taken from the opening to the basal angle measures 160 mm. The shape of the siphonal cartilage is ovate, with its anterior end pointed. Its length is 105 mm and it is about half as long as the mantle cartilage.

Arms.:—As the epidermis is torn off, the swimming webs and the protecting membranes can not be recognized. Only along the outer side of the right third arm the trace of the keel of the web can be observed. From a few remaining suckers on the arms we conclude that these are arranged in two rows. These suckers are semi-spherical in shape, and with slender pedicels. Nothing definite can be said of the number, the size and the structure of the horny rings, since in most of them even the traces of the pedicels can not be discerned. But as all the arms are preserved to their tips, the following measurements of their lengths are taken:

	Right arms.	Left arms.
I	480 mm.....	450 mm.
II	670 mm.....	580 mm.
III	610 mm.....	650 mm.
IV	710 mm.....	740 mm.

Tentacles.:—As the tentacles are relatively better preserved than other parts of the animal, excepting that the epidermis is worn off, a description of their more important structures can be given. Their entire length

is 1460 mm left, and 1420 mm right respectively, of which the club on the left measures 230 mm, and on the right 205 mm, i. e. about 1/6 on the left and 1/7 on the right. The section of the stalks is rectangular, their breadth and depth are as follows:—

	Left tentacle.		Right tentacle.	
	Breadth.	Depth.	Breadth.	Depth.
At the base.....	35 mm.	20 mm.	37 mm.	15 mm.
At the middle portion	22 mm.	12 mm.	23 mm.	10 mm.

The oral side of the club is flattened, with traces of the protecting membranes on both sides. A trace of web running along the ridge is to be observed on its outer side.

The pads and suckers on the carpal portion are arranged in an oval area of 26 mm in length and 15 mm in breadth, on both tentacles. No trace of a membrane is to be seen surrounding the area. The pads and suckers are arranged in six oblique rows beginning with the ventral ones and ending with the dorsal. These have the same arrangement on the right and on the left, alternating with each other as follows:—

The relative positions of pads (P) and suckers (S) as observed from ventral ones obliquely dorsalwards:—

Left.	Right.
P. S. P.	S. P. S.
S. S. S.	P. P. P.
P. P. P. P.	S. S. S. S.
S. S. S. S.	P. P. P. P.
P. P. P.	S. S. S.
S. P. S.	P. S. P.

Moreover, there is an extra pad dorsal to the fifth, and an extra sucker dorsal to the sixth oblique row on the left, and on the right an extra pad between the pad and the sucker on the top of the sixth row. Eighteen pairs of hooks are counted on the hand portion. These are arranged in two rows, but only the seventh which is 9 mm long, and the eighth which is 10 mm long, remain on the left tentacle; and on the right the sixteenth which is 10 mm long, and the eleventh which is 8 mm long. These remaining hooks and the traces of lost ones show, that the hooks of the

ventral row are larger than those of the dorsal, and that the eighth, the ninth, and the tenth hooks are the largest in the same row, while their sizes diminish gradually from the seventh proximally, but suddenly from the eleventh distally.

The distal portion of the club is flattened from side to side and assumes a spatula-like shape. This portion is 4 mm long, and 3 mm wide at the tip, and 2.5 mm wide at the base. It appears that the inner surface of this portion is beset with suckers, of which nine pedicels remain to be recognized.

From the above, imperfect as they are, we can formulate the following characters which are common to the present form, and the similar animals described by DALL-VERRILL and THOMPSON:—

1. The eye-lid has a distinct sinus placed subventrally. In DALL's figure the sinus is placed in the line passing through the middle of the eye, which is most probably to be taken as an error in his sketch.

2. The suckers on the sessile arms are arranged in two rows.

3. The tentacular club consists of a carpal portion with a group of pads and suckers arranged elliptically, a hand portion with two rows of hooks, and a distal portion with small suckers.

4. No nape fold, but with three pairs of folds on the throat.

5. The mantle cartilage is a linear ridge and is twice as long as the siphonal cartilage.

6. The under-skin of the mantle shows the plastered structure.

7. There is a distinct groove on the mid-dorsal line of the mantle.

All these characters combined show without doubt that the present form belongs to the genus *Moroteuthis* in the family *Onchoteuthidae*. Of this genus only two species have so far been known, *M. robusta* (DALL) and *M. ingens* (E. A. SMITH). That it is not *M. ingens* can be seen from the size of the animal as well as from the shape of the mantle and the fins. Of *M. robusta*, we know that only four specimens have up till now been examined. Three of these were discovered by D. H. DALL near Iliuliuk, Uralaska Island, off the coast of Alaska on the 26th of April and 8th of May, 1872. DALL

made sketches and measurements of the specimens; these were described by D. E. VERRILL under the name of *Ommastrephes robustus* in 1876. The fourth specimen, also obtained from the same locality, is described by D'ARCHY THOMPSON by the name of *Ancistroteuthis robusta* (DALL).

The large size of the animal, the general shape of the mantle and the fins, and the locality where the four specimens were obtained, lead us to think, that our specimen is identical with *M. robusta*. As, however, all the specimens obtained from Unalaska were found on the beach, and more or less decomposed and broken, it is very difficult to identify our form which, as stated above, is also in very poor condition, with those described by the above authors. The following comparison between the four specimens and ours will perhaps help us to form a judgement about their specific identification:—

1. The length of the animals :

DALL'S specimen... ..	No. 1.....	1168 mm ¹ .
" " 	No. 2.....	1550 mm.
" " 	No. 3.....	2324 mm.
THOMPSON'S specimen.....		1575 mm ¹ .
Our specimen.....		1220 mm ² .

2. The length of the mantle and the attachment of the fin to the same:—

	Length of the mantle :	Length of the attachment of the fin :	Length of the attachment of the fin in % of that of the mantle :
DALL'S specimen No. 1.....	1168 mm	?	?
" " No. 2.....	1550 mm	857 mm	55 %
" " No. 3.....	2324 mm	1219 mm	52 %
THOMPSON'S specimen.....	1575 mm	863 mm	55 %
Our specimen.....	1220 mm ²	610 mm	50 %

3. The form of the fin in the present specimen lies somewhat between that sketched by DALL (Figs. 1 and 2, Plate XXIII) and that described by THOMPSON, but much nearer to the latter. The broadest portion

1. The figures given by DALL and THOMPSON in inches are estimated in millimetres.
 2. Approximately, as stated above.

of the fins described by THOMPSON and that of our specimen lies far more forwards than in that sketched by DALL. Whether this latter is the exact copy of the specimen is perhaps doubtful, and may probably be considered as an error, just as with the position of the sinus of the eye-lid as above stated.

4. From the descriptions and sketches given by DALL, VERRILL and THOMPSON, the shape of the mantle of the four specimens coincides in general with that of our specimen, slight differences in the proportional length and the breadth are to be accounted for partly as individual variations, and partly by the condition of the animals at the time of observation.

5. The armature of the tentacular club. In DALL'S specimens the tentacular clubs were wanting, but THOMPSON gives a good figure and a detailed description of the right club, from which we can conclude that the present specimen has the same structure as that of THOMPSON'S. An interesting point about them is that the arrangement of the connective organs in the carpal portion of the right tentacle in THOMPSON'S specimen exactly corresponds with that of the left club of our specimen, except that in the second oblique row there is one sucker less in his specimen than in ours. The arrangements of the connecting organs in his specimen and in ours can be compared thus:—

THOMPSON'S specimen.		Our specimen.
Right club.		Right club. Left club.
P. S. P.	.	S. P. S. P. S. P.
S. S. S. S.		P. P. P. S. S. S.
P. P. P. P.		S. S. S. S. P. P. P. P.
S. S. S. S.		P. P. P. P. S. S. S. S.
P. P. P.		S. S. S. P. P. P.
S. P. S.		P. S. P. S. P. S.

This reversion of right and left between our specimen and that of THOMPSON'S is perhaps better to be accounted for as individual variations than as a specific distinction between the two specimens.

6. The question of the locality. That there is a close similarity in the marine fauna of the coast of Unalaska and of the Pacific coast near the Tugaru strait, can be conjectured by the relative position of the two

localities; among many animals and plants common in these waters we can cite for instance the gigantic octopod, *Polypus punctatus*.

All these points taken together make us believe that the present form is synonymous with *Moroteuthis robusta* observed and described by DALL, VERRILL and THOMPSON. In this case it forms the fifth example of this interesting species of *Oegopsida* hitherto described.

Literature cited.

1. VERRILL, A. E.:—The Cephalopoda of the North Eastern Coast of America. Transactions of the Connecticut Academy of Sciences, Vol. V. 1881.
2. THOMPSON D'ARCY W.:—On a rare Cuttlefish, *Anchistroteuthis robusta* (DALL) STEENSTRUP. Proceedings of the Zoological Society of London. 1900.
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EXPLANATION OF PLATES.

PLATE XLIII.

Moroteuthis robusta.

All Figures reduced to about $\frac{1}{3}$ nat. size. A meter scale is given on the left side of the plate.

Fig. 1. Right tentacle and the tip of the left.

Fig. 2. Dorsal view of the mantle with siphon projecting out of the mantle orifice.

A median furrow is plainly seen on the anterior portion.

Fig. 3. Dorsal view of the head with arms.

Fig. 4. Dorsal view of the fins.

PLATE XLIV.

Moroteuthis robusta.

In this plate the Figure 7 is a photographic reproduction, all the others drawn from nature by Mr. K. Yokoyama.

Fig. 5. Ventral view of the siphon laid open; the valve, and a trace of the attachment of the central siphonal organ are seen. $\frac{1}{2}$ nat. size.

Fig. 6. Siphonal cartilage. $\frac{1}{2}$ nat. size.

Fig. 7. A piece of the dermis taken from the anterior portion of the mantle on the left side. Nearly natural size.

Fig. 8. Left tentacle showing fixing apparatus and hooks. $\frac{2}{3}$ natural size.

Fig. 8. *a*. Terminal flattened area of the tentacle showing nine pedicels of suckers. Magnified about 3 diameters.

Fig. 9. A small portion of the right tentacle, showing the fixing apparatus and five pedicels of the proximal suckers. $\frac{2}{3}$ nat. size.

Fig. 1.



Fig. 2.

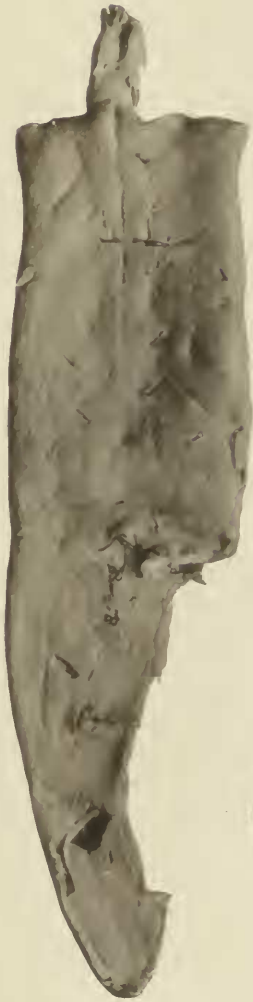


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 8.

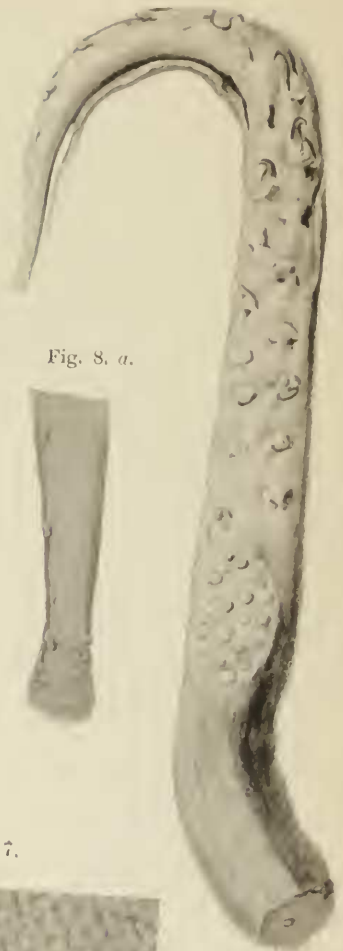


Fig. 8. a.

Fig. 7.



Fig. 9.



Fig. 6.



Fig. 7 photographed by Mr. Fukuhara, Figures 5, 6, 8 and 9. drawn by Mr. K. Yokoyama from nature.